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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/005,890	12/05/2001	Jing-Jong Pan	020858-001800	7938

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EXAMINER	
CALEY, MICHAEL H	
ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 07/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/005,890	PAN ET AL.	
	Examiner	Art Unit	
	Michael H. Caley	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 13-18 is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Koda (Japanese Patent No. 05-249507).

Koda discloses a liquid crystal cell unit comprising:

a first cholesteric liquid crystal cell receiving incident light, said first cholesteric liquid crystal cell reflecting circularly polarized light of one state of said incident light or transmitting said incident light responsive to a control signal (Figure 1 elements 15 and 5-1; Abstract);

a second cholesteric liquid crystal cell arranged with respect to said first cholesteric liquid crystal cell to receive light transmitted by said first cholesteric liquid crystal cell, said second cholesteric liquid crystal cell selected to reflect or transmit light from said first cholesteric liquid crystal cell responsive to said control signal when said cholesteric liquid crystal cell reflects said circularly polarized light of said one state or transmits said incident light respectively (Figure 1 element 5-2; Abstract).

Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Shankar et al. (U.S. Patent No. 4,991,924 "Shankar").

Shankar discloses a liquid crystal cell unit comprising:

a first cholesteric liquid crystal cell receiving incident light, said first cholesteric liquid crystal cell reflecting circularly polarized light of one state of said incident light or transmitting said incident light responsive to a control signal (Figures 3A and 3B elements 104, 102, and 110; Column 6 lines 7-35);

a second cholesteric liquid crystal cell arranged with respect to said first cholesteric liquid crystal cell to receive light transmitted by said first cholesteric liquid crystal cell, said second cholesteric liquid crystal cell selected to reflect or transmit light from said first cholesteric liquid crystal cell responsive to said control signal when said cholesteric liquid crystal cell reflects said circularly polarized light of said one state or transmits said incident light respectively (Figures 3A and 3B elements 104, 102, and 110; Column 6 lines 7-35; Figures 2A and 2B; Column 5 lines 32-65)).

The Examiner notes that as proposed, claim 1 denotes a cholesteric liquid crystal cell responsive to a control signal to transmit or reflect light, however, no indication is given in the claim that the orientation of the liquid crystal material is changed. As such, claim 1 is anticipated by both the embodiment disclosed in Figures 3A and 3B and described in Column 6 lines 7-17 and the embodiment disclosed in Figures 2A and 2B and described in Column 5 lines 32-65) in which the delay of the waveplates is switched using a control signal to which the transmission and reflection properties of the liquid crystal cells is responsive. Additionally, Shankar teaches applying an electric field to the cholesteric liquid crystal in further embodiments (Column 6 lines 18-35) which would render obvious an operation in which the control signal

directly affects the orientation of the liquid crystal layers. The teaching, however, is not relied upon in the above rejection since no such change in the state of the liquid crystal layer is proposed in claim 1.

Regarding claim 2, Shankar discloses a pi-phase waveplate element between the first and second cholesteric liquid crystal cells (Figures 3A and 3B element 106).

Regarding claim 3, Shankar discloses the pi-phase waveplate element as comprising a third liquid crystal cell (Column 4 lines 55-63)

Regarding claim 4, Shankar discloses the pi-phase waveplate element as comprising a plate of birefringent crystal material (Column 4 lines 55-63).

Regarding claim 5, Shankar discloses the first cholesteric liquid crystal cell as comprising a first cholesteric liquid crystal reflecting circularly polarized light in one state and the second cholesteric liquid crystal cell comprising a second cholesteric liquid crystal reflecting circularly polarized light in an opposite state (Figures 3A and 3B).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shankar in view of Pan et al. (U.S. Patent No. 5,742,712 "Pan '712").

Regarding claim 6, Shankar discloses an optical switch device comprising:

first and second optical fibers, each having end surfaces coincident with a common surface (Figure 7A elements 376 and 378);

a first collimating GRIN lens having first and second end faces, said first end face proximate with said common surface (Figure 7A element 372);

a third optical fiber (Figure 7A element 386);

a second collimating GRIN lens having first and second end faces, said first end face proximate said third optical fiber end face (Figure 7A element 374);

a cholesteric liquid crystal cell between said second end faces of said first and second GRIN lenses as proposed in claim 1 (see above);

said elements arranged and oriented with respect to each other so that light from said first optical fiber passes through, and back from, said first collimating GRIN lens, and said cholesteric liquid crystal cell unit into said second optical fiber when said cholesteric liquid crystal cell units reflects light responsive to said control signal, and light from said first optical fiber passes through said first collimating GRIN lens, said cholesteric liquid crystal cell unit, and said second collimating GRIN lens into said third optical fiber when said cholesteric liquid crystal cell units transmits light responsive to said control signal (Figure 7A Transmitted Beam Connection Mode, Transmitted Beam Bypass Mode).

Shankar fails to disclose first and second sleeves having a central longitudinal channel and an end face in which the optical fibers are fixed as proposed. Pan '712, however, teaches

such a sleeve and channel construction in the disclosure of a 2x2 electromechanical switch (Figures 3A and 3B elements 26, 34, 50, and 52).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the switch disclosed by Shankar having a sleeve as taught by Pan '712 for the input and output fibers. Shankar discloses the input mechanism as a pair of collimating lenses on each side of the cholesteric liquid crystal cell. Such a construction may be improved upon by including both fibers on each side within a single input sleeve. As taught by Pan '712, the spacing of the cladding of each fiber would provide a sufficient distance to selectively couple between the cores of each of the fibers within a sleeve. Additionally, Shankar discloses the GRIN lenses as effective to gradually bend the input light to strike the cholesteric liquid crystal layer. One would have been motivated to modify the switch as described in order to allow for a simpler and less costly manufacturing process. By combining the pair of fibers on each side of the device, less fiber sleeve to GRIN lens connections are necessary. Furthermore, the additional collimating lens disclosed by Shankar would not be necessary, rendering a device having the same function, but with less parts and a simpler construction. Modification of the GRIN lens to accommodate for the difference in separation between the input fibers would have been within reach of one of ordinary skill in the art.

Regarding claim 7, Shankar discloses a pi-phase waveplate element between the first and second cholesteric liquid crystal cells (Figures 3A and 3B element 106).

Regarding claim 8, Shankar discloses the pi-phase waveplate element as comprising a third liquid crystal cell (Column 4 lines 55-63)

Regarding claim 9, Shankar discloses the pi-phase waveplate element as comprising a plate of birefringent crystal material (Column 4 lines 55-63).

Regarding claim 10, Shankar discloses the first cholesteric liquid crystal cell as comprising a first cholesteric liquid crystal reflecting circularly polarized light in one state and the second cholesteric liquid crystal cell comprising a second cholesteric liquid crystal reflecting circularly polarized light in an opposite state (Figures 3A and 3B).

Regarding claim 11, Shankar discloses a fourth optical fiber in which the switch operates as proposed (Figure 7A).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pan (U.S. Patent No. 5,276,747 "Pan '747").

Shankar fails to disclose the cholesteric liquid crystal cell unit as reflecting light responsive to a first control signal voltage and transmitting light responsive to a second control signal voltage and proportionally transmitting and reflecting light responsive to control signal voltages intermediate the first and second control signal voltages. Pan '747, however, teaches an attenuating embodiment of a similar liquid crystal switching device in which the transmission of the signal is controlled via an analog signal as proposed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the switch disclosed by Shankar to perform an attenuating function. As taught by Pan '747, optomechanical switches and attenuators inherently possess disadvantages related to size, cost, reliability, and transition speed. One would have been motivated to modify the switch disclosed by Shankar to perform an attenuating function to

provide an attenuator overcoming such disadvantages of typical devices performing similar functions, such as optomechanical devices. In modifying the Shankar device as such, it would have been inherent that an amount of the signal would be reflected proportional to the amount of signal transmitted.

Allowable Subject Matter

Claims 13-18 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art fails to disclose a WDM add/drop multiplexer having two sleeves coupled to two GRIN collimating lenses, four port optical fibers, and a cholesteric liquid crystal cell unit switching device all positioned and coupled as proposed in which a wavelength-dependent filter transmitting light at selected wavelengths and reflecting lights at other wavelengths is positioned proximate to the second end face of the first collimating lens. The prior art fails to suggest separation of light in such a device based on wavelength.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H. Caley whose telephone number is (703) 305-7913. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

mhc
June 17, 2003